To Professor Fraser-Harris
with kind regards of the author.

James Lind and Scurvy

BY

RALPH STOCKMAN, M.D.
Professor of Materia Medica and Therapeutics, University of Glasgow

Reprinted from the EDINBURGH MEDICAL JOURNAL, *June* 1926

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JAMES LIND'S outstanding services to the British navy, to seafaring men of all nations, and to medicine, merit a much wider recognition than is usually accorded them. In Clowe's compendious work, *The Royal Navy*, he is merely referred to as "one Dr Lynn," and this in connection with the distillation of fresh from sea water, no further notice being taken of him, and no mention made of the great part he played in banishing the terrible plague of scurvy from our fleets. Yet Sir John Simon, when Medical Officer to the Local Government Board, could say, "the fact that scurvy has become an almost-forgotten disease is due emphatically to Lind; and to him we owe such saving of life as probably to no other one man except the discoverer of vaccination." The few medical writers who have specially interested themselves in his work and its achievement have not been wanting in their appreciation of both, but they constitute a very small number. The reasons for this comparative neglect are twofold. In the first place, Lind did what only a very select few among medical men have ever done, and it has caused him to be forgotten rather than remembered. He undertook the study of an important and devastating disease, he considered it from every aspect, and he propounded measures for its prevention and cure, which, on their application, proved so successful that the disease ceased to have any practical importance. Consequent on the almost total disappearance of scurvy from medical practice medical interest in it also ceased to a large extent, and Lind became a mere historical name more or less casually mentioned in connection with its extinction. In the second place, the ordinary materials for constructing even a slight biography are exceedingly scanty and difficult to trace, so that such as they are, they have never been properly explored.

There is a short notice by Norman Moore in the *Dictionary of National Biography*, a full and much more appreciative account by Rolleston in the first volume of the *Journal of the Royal Naval Medical Service*, and a brief anonymous article in the *Practitioner* for 1896.

James Lind was born in Edinburgh on 4th October 1716, his father James Lin or Lind being a merchant and burgess of the city, and his mother Margaret Smellum.* At this time they seem to have spelt their name indifferently, as Lin, Linn, Lynd and Lind. He came of an ancient landed family, the Linns of that ilk, who had owned a small estate of 240 acres near Dalry in Ayrshire since at least 1207, when Robert de Lynne appears as witness to a deed of donation to the monastery of Kelso. The estate took its name from a linn or waterfall on the little river Caaf, and the surname of Lynne was assumed by the owners of the lands and barony from the time that surnames became hereditary in Scotland. From Robert de Lynne was lineally descended James Lind of that ilk, who, in 1532, sold his lands, and was afterwards known as of Croftfute, a small property in the immediate neighbourhood.† His son John, probably finding that Croftfoot afforded a somewhat meagre subsistence, sold it in the reign of Queen Mary and migrated to Edinburgh, where, according to the genealogy, "his family have subsisted with reputation ever since." His son, also John Lind, had a family of five boys, one of whom settled permanently in Poland. Another son, James, joined him there, but returned home and engaged in business. He was the father of our James Lind, and his two sons were born in Edinburgh, their births and baptisms being duly recorded

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* This is a surname of many spellings—Smelum, Smellm, Smellome and Smelholme. John Smellome or Smellum was admitted a Fellow of the College of Physicians in 1694 and elected Treasurer in 1704. "Docter John Smelum Physitian" is recorded as one of the two witnesses of the baptism of their second son John in 1719, and he was probably a brother of Mrs Lind.

† These particulars are taken from *The Genealogy of the Families of Lind and the Montgomeries of Smithton, Windsor, printed in the Private-press of J* L** 1795. It was compiled by Sir Robert Douglas, an eminent authority on Scottish genealogies, and was printed by another James Lind (1736-1812) who was physician to the household of George III. at Windsor and a first cousin once removed of his namesake. He was a man of some mark, and a fairly full account of him is given in the *Dictionary of National Biography*. He practised in Edinburgh for a time and had a house in Princes Street.

JAMES LIND, M.D.

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in the register of the City Parish Church. The family by this time had an influential Edinburgh connection. His father and three uncles appear to have been substantial merchants. One of them bought the estate of Gorgie, was a member of the town council and twice chosen a bailie, a cousin, George Lind, became Lord Provost and afterwards member of parliament for the city, and another cousin was the first-appointed sheriff-depute of Edinburgh.

At the age of fifteen James Lind began his medical studies as an apprentice to George Langlands, a member of the Incorporation of Surgeons. The minute recording it is still extant: "22nd Dec. 1731. In presence of the Deacon and his Council compeared James Lind and is booked apprentice to George Langlands conform to Indentures and payed all the dues." He seems to have received his whole professional education in Edinburgh, but in his day the medical school was in a somewhat embryo stage and probably contributed only a small part of it. In 1505 the Town Council had granted to the barber-surgeons of the town a charter or seal of cause erecting them into an incorporation—one of the famous "Crafts" of Edinburgh—and, in 1657, they had been joined by the Apothecaries and ceased to function as barbers. From their foundation the Surgeons had always provided some fragmentary teaching in anatomy, but probably more for the enlightenment of their own members than of students. In 1695 they had obtained an act of parliament empowering them to examine all who carried on the practice of medicine in the Lothians and certain neighbouring counties, and from 1694 regular instruction in anatomy had been given under their auspices in the Surgeons' Hall. The impetus for the formation of a medical school in the more modern sense seems, however, to have come from the College of Physicians which had been founded in 1681. Its fellows were all doctors of medicine who had mostly studied and graduated abroad and were therefore cognisant of better things than existed in Scotland at the time. Certain of them, in 1720, joined the anatomy school in the Surgeons' Hall and delivered courses of lectures on chemistry and on the institutes and practice of medicine. Monro *primus* was already teaching anatomy and surgery within the University, and, in 1726, these lecturers applied to the Town Council to be made professors in the "Colledge," a request which was granted but without any salaries attached, professorships of midwifery and of botany and materia medica being added later. A regular Medical Faculty was thus instituted with systematic courses of lectures, but it was only in 1748 that public clinical instruction was first given to students in the Royal Infirmary. When Lind was pursuing his studies a certain amount of university teaching was therefore available, but the students were as yet practically comprised in the pupils and apprentices of the Chirurgions and Chirurgion-Apothecaries of Edinburgh and its neighbourhood, and, like others of his time, he must have obtained the bulk of his strictly professional training from his work and experience as an apprentice. Edinburgh then contained only some thirty to forty thousand inhabitants, closely crowded together in tenements from the Castle to Holyrood, the new town was non-existent as yet, the infirmary consisted of a small house in the Cowgate with six beds, and most of the medical teaching was probably a mere echo of Boerhaave. It does not appear that he ever became a member of the Incorporation of Surgeons. In 1739, at the age of 23, he entered the naval medical service in which he served till 1748. As he had no degree or qualification except his apprentice indentures he probably appeared before a medical board in London for examination and was passed into the service much in the same way as Smollett describes Roderick Random to have been. Let us hope his subsequent experiences and his duties were more pleasant than those depicted in the novel as falling to the lot of a surgeon's mate. His brother John was an officer in the Royal Navy and this may have determined his choice. During his ten years at sea he saw much service in the English Channel, and sailed to the Mediterranean, the Guinea Coast and the West Indies. These voyages aroused his interest in tropical diseases and hygiene and gave him first-hand experience of the deadly effects of foreign climates in those days, experience which he afterwards turned to good account in his writings. When Surgeon to H.M.S. *Salisbury*, and while cruising in the Channel, he had two serious outbreaks of scurvy to contend with, in one of which there were 80 cases out of a crew of 350.

In 1748, on leaving the navy, he graduated M.D. at the University of Edinburgh, his thesis, a very trifling effort, being entitled "De morbis venereis localibus." In the same year he started practice after petitioning the Royal College of Physicians to grant him their licence to do so "within the City of Ed. & Libertys yrof without any tryal or Examination," on the grounds that he was a "Graduat Doctor of Medicine in the University of Edin." In 1750 he became a Fellow of the College, and in 1757 was elected its Treasurer, an office which he resigned in the following year on his appointment as Physician to Haslar Hospital. He probably owed this preferment to Lord Anson, who was at the time First Lord Commissioner of the Admiralty, and to whom, four years previously, he had dedicated his book on the scurvy. Anson had a reputation for sound judgment in the selection of officers, and if he was actually responsible for Lind's promotion he was fully justified in the event. Lind's letter of resignation of the treasurership of the College is as follows:—

To Sir ALEXANDER DICK, Bart.
President of the royal Colledge
of Physicians in Edinburgh.

SIR,—I beg leave to inform you that having accepted of being Physician to His Majties Royal Hospital at Haslar I am to leave this Country so soon as I have settled my private affairs, which I expect to accomplish in a few days.

It affects me much to think I am so soon to be deprived of the Society of the many worthy members of our Colledge in whose company I have so often met with entertainment, & have always been improved. As I can no longer discharge the office of their treasurer, & am unwilling to occasion an unnecessary meeting of the Colledge upon account of my leaving Scotland if it is agreable; I shall put the papers in my custody into the hands of Dr Boswell my Predecessor in office, to whom also I shall pay viz £20 : 3 : 2½— and Mr Woderope Writer in Edinr. my factor will transmit to me the proceedings of the Colledge upon my accounts.

While due Compliments wait upon my fellow Members I beg you'll be pleased to accept of my particular & sincere respects being truly

Sir, A Sincere Wellwisher to the prosperity of the Colledge of Physicians in Edr. & Your most obedient humble servant

JAMES LIND.

EDINR., 18 *May* 1758.

The salary was £200 per annum, but he was allowed to engage in civil practice, and it appears that he did so, but probably only as a consultant. The hospital was administered by the "Physician and Council," but their powers were very strictly limited and controlled by the Commissioners of Sick and Wounded in London, and their salaries seem to have been paid very irregularly. The whole personnel, medical and non-medical, with the exception of the chief officers, were lodged in the hospital, with their wives and families when they had any, and the consequent amount of general bickering and indiscipline makes strange reading, but is hardly to be judged by present-day standards.[1] In his duties as superintendent Lind probably did not enjoy exactly a bed of roses, but Rolleston says "the records of Haslar show that he was eminently a man of peace."

In Haslar Hospital he worked for twenty-five years as its medical chief, resigning, in 1783, owing to poor health, at the age of 67, and being succeeded by his son John, who had been trained under him.

On his retiral his portrait was painted by Sir George Chalmers, but cannot now be traced. Fortunately an etching was made from it, a copy of which has been preserved at Haslar, and from it the accompanying photograph was taken.

He died at Gosport on 13th July 1794, and is buried in Porchester where there is a tablet to his memory in the church.

The hospital at Haslar had only been opened in a somewhat unfinished state four years previous to Lind's appointment, and at this time could accommodate about 1000 patients, thus affording him exceptional opportunities for the clinical study of scurvy, typhus, agues, and other prevalent diseases, of which he took full advantage. In his first two years of office he states there were 5743 admissions, of which 1146, or one-fifth of the whole, were cases of scurvy. The Channel Fleet might put in to Portsmouth with 1000 or even 2000 cases on board, single ships often arrived in a similar plight, and during the seven years war with France and Spain he usually had 300 to 400 cases under his daily charge in hospital, and even 1000 at one time. No man before or since has had the same opportunities of study, or such wealth of experience in cases of scurvy ranging from mere debility to its most severe and fatal forms, and his long tenure of office allowed his views to become matured and modified. In addition, his position put him in touch with the naval surgeons of our own fleets on distant stations, and with them, as well as with the naval authorities of certain foreign countries, he kept up an active correspondence regarding scurvy in all its aspects and in all climates. Shortly after his arrival at Haslar he wrote a description of it to the President of the College of Physicians, which is interesting as a comparison with present-day conditions:—

To Sir Alexander Dick, Bart.
of Priestfield.

Dr Sir,—I received the favour of yours of the 17th July & am extremely obliged to you for the trouble taken to inform me of my accounts as treasurer to the R Colledge of Physicians in Edr being found in proper order & the Ballance properly stated & minuted in the Colledge Books.

I always esteemed myself extremely honoured by my fellowship in that Colledge & shall endeavour to render the several members all the Services in my power.

Haslar Hospital is an immense pile of building & tho' of Brick will when finished have cost the Government about £100,000. It is surrounded by a high wall (to prevent desertion) containing 32 acres of ground. It will certainly be the largest hospital in Europe when finished but even then will not be able properly to receive about 2200 patients. This is owing to the Largeness of the regular wards.

The annual expence at present is £14,000 pr an but then we never have had above 1040 patients, we this winter shall open wards for 500 patients more.

The hospital is under the direction of the Physician and Council—the latter consists of the Physician who presides two master Surgeons, the Agent & Steward, & lately two new members are added to the council viz Dr Welch Physician to Gorton hospital (which receives the marines only about a mile distance from us) & the Surgeon of that hospital.

But this Council must act entirely by Orders from the Board of Sick & hurt.

Six upper assistant Surgeons at 5 sh pr Day & 4 under assistants at 3s 6d were allowed with an apothecary & two assistants but it is proposed to reduce the number of assistant Surgeons & increase the number of apothecaries, as these last are to be appropriated to visit with the Physician in his Wards.

We are remarkably clean. No patient is admitted into the hospital until he is stripped of all his cloths & well washed with warm water & soap in tubs always kept for the purpose, he is allowed the hospital dress during the time he continues in the hospital or until his cloths are returned him quite clean, & he is regularly shifted and kept quite neat clean & sweet at the Government's expence. None of his cloths bedding &c is ever permitted to be brought into the hospital we have large outhouses for their reception.

In cases of fevers the Patients cloths are directly fumigated with Brimstone in the smoak house & baked in an oven sprinkled with vinegar. The fever Wards are cut off from all communication with the rest & nothing but hospital dresses are used in them. We have sometimes 90 women nurses at a time their pay is £12 pr an. In our wash house we have seldom less than 24 women constantly employed. All these are under sober & discreet Matrons.

We have about 20 Labourers at 1s 6d everyday employed in the different branches of Duty in the House. And indeed no expence is spared for the regular management of the house.

I shall be glad at all times to have the pleasure of hearing that you are well. I beg that my best respects may wait upon Lady Dick & Miss & that my compliments may be made acceptable to all the Members of the Colledge, believing that I am with more particular regards

Dr Sir
Your most obedient & obliged hble Servant
James Lind.

Royal Hospital at Haslar,
3*d Sept.* 1758.

P.S.—I beg youll excuse this Letter having no cover as the paquet in which it is enclosed is already very large.

Lind's personality and abilities seem to have attracted little attention during his lifetime except from a small group of his naval professional colleagues who admired him and looked up to him as an authority on all matters connected with the diseases of seamen—a "marine Hippocrates," as one of them calls him—and he received no honours or public recognition of any kind from the Admiralty or any of the learned bodies of his own country. He was an original Fellow of the Royal Society of Edinburgh, but this came to him automatically as a member of the Philosophical and Medical Society when it was transformed by Charter, in 1783, into the Royal Society. His writings show him to have been a man of very considerable general culture and education. This is evidenced by the easy way in which he handles not only medical literature but historical or other outside matters which incidentally emerge, and by his valuable and complete synopsis of all the writings on scurvy previous to his own, which is a model of accuracy and fair statement. So far as I know nothing of the kind had ever been done before in medical literature. In his day the lectures in the University classes, with the exception of those on anatomy, were delivered in Latin,[2] and he everywhere shows a close and familiar acquaintance with that language, as well as some knowledge of Greek and French. His works are in general fully "documented," but he always expresses his own experience and opinions quite clearly and definitely, and shows himself a just and often close critic. In his work on scurvy he was clearing up a chaos, and in presenting his own full and simple account of the disease, which was in many respects novel and opposed to the current teaching of the schools, he no doubt felt it necessary to go into detail and to reason somewhat fully in order to carry conviction and "so endeavour to remove such objections as might arise from doctrines imbibed in younger years in schools and universities." In his time the doctrines and therapeutics of Boerhaave completely dominated medical teaching, and one has only to compare his account of scurvy with Lind's to realise what an immense stride in advance the latter had made on the ideas then prevalent. Hirsch[3] stated the position very clearly, in 1860, when he says, "I know of only one author who has taken the trouble to enquire into the history at first hand and to subject an obscure heap of materials to the light of criticism."

Thomas Trotter and Gilbert Blane are the only two of his contemporaries who have left any record of his mental attributes or personal character and both were considerably his juniors, but both had seen much service afloat, both had held the important position of physician to the Fleet, and the former had been second physician at Haslar.

Trotter[4] says: "The leading trait of his professional character has marked him the man of observation. When he first published his book he had, no doubt, many authors to consult; but their facts were often distorted, their theories absurd, and their practice empirical, so that much was left to himself;" and again, "Dr Lind's work will remain a valuable legacy to the naval service of Great Britain, as it will be a lasting monument of the Author's industry and abilities." Trotter was far from being a blind admirer, but always refers to him in terms of great respect.

Blane, on several occasions, has expressed his opinion in emphatic terms of the great value of Lind's work on scurvy: "The subject in the description as well as in the practical part, has in a manner been exhausted by Dr Lind, whose treatise on the subject is more full, judicious, and satisfactory than that of any other author, and this work is more complete in all points, than any other work with which I am acquainted, upon any other medical subject."[5]

Speaking of Woodall's recommendation of lemon juice he says: "It is singular that this important fact should have been hardly known for more than a hundred years afterwards, when the late Dr Lind of Haslar hospital revived and diffused this valuable piece of knowledge by his writings. It was this author who first clearly stated the singular powers of this remedy in the cure of scurvy, for Woodall only affirmed that its virtues were far superior to all other remedies."[6] He returns again to this point: "It is however a curious fact, though mortifying to human wisdom, and to our national sagacity, that the virtues of this remedy were equally well known in the beginning of last century as they are at this moment; yet it has never till now attracted the attention either of medical men or of sea officers to the degree it ought; insomuch that it had, in a great measure, fallen into neglect, when the knowledge of it was revived and its character retrieved, by the writings of the late Dr Lind."

Of course every naval surgeon and officer knew the value of fresh fruits and vegetables in scurvy, and used them freely when they could be obtained in port, but the difficulties of carrying a sufficient supply to sea were regarded as insuperable. Individual commanders had even taken supplies of lemon juice on long voyages, but this method of prophylaxis had been lost sight of and practically forgotten in naval administration and medical practice. Lind's book was published in 1753, and, as is well known and has often been commented on, his advice regarding the prevention and treatment of scurvy in the navy was ignored until 1794 when Blane, who was then a member of the Sick and Wounded Board, arranged that a small squadron destined for the East Indies should be furnished with an adequate supply of lemon juice. It was served out daily on the flag-ship, and on arrival at Madras, after a twenty-three
23 weeks' voyage, there were no cases of scurvy on board. A simultaneous trial in the Channel Fleet proved equally successful, and in 1795 an order for a general supply of lemon juice to H.M. ships was issued, with the result that in a few years scurvy had become a thing of the past.[7] Henderson Smith[8] says, that in stating that scurvy was totally rooted out within two years, "Sir Gilbert Blane was swayed by an

optimistic enthusiasm after the work had been accomplished and found to be good," and that "thousands of cases continued to occur well into the next century." It is quite understandable that in those days of sailing ships and slow communication, and with the fleet widely scattered on distant stations, it took some few years to accomplish a complete reformation, but Trotter,[9] in 1803, bears witness that "a case of scurvy requiring to be sent to hospital has not come under my observation since 1795"; and Blane that, in 1800, after a cruise of four months the Channel Fleet had no cases of scurvy on board, whereas, in 1780, after a ten weeks' cruise, it was overrun with the disease.

The blame for the long delay in adopting Lind's advice has been very generally laid on official inertia at the Admiralty, but it should probably, with more justice, be borne by its medical advisers. It is not to be supposed that the Lords of the Admiralty and Government officials could determine the relative merits of one form of medical treatment in preference to another. They, no less than the executive officers, were very fully and even pathetically alive to the often disastrous inefficiency caused in ships of war by scurvy, and seem to have been extremely liberal and anxious in providing extract of malt and other inferior or reputed remedies, and when the real remedy was somewhat belatedly put before them, there seems to have been no want of alacrity in supplying it. Blane[10] himself, in 1781 and 1782, when he was in medical charge of the West Indies Fleet, had no better remedies to suggest or to offer for two serious outbreaks of scurvy than molasses, extract of malt, wine, and sour krout, until the fleet put into land and procured a supply of limes. At that time Blane had still to learn how to prevent and treat scurvy successfully at sea, and he only learned it later from Lind's book. Since his time there have been many outbreaks of scurvy during famines, among troops and civil populations under war conditions, in the Arctic, and in institutions, but the disease, as a sea disease, has now practically disappeared, although it required many years and two acts of parliament (1844 and 1867) to eradicate it from our mercantile marine.

With regard to the delay in instituting a lemon-juice ration, the truth seems to be that medical schools and writers were obsessed with their theories, and when officially consulted, as they often were, gave very poor advice, and that naval medical officers, who alone knew the disease practically, had failed to grasp the full bearing of Lind's teaching although it had been before them for so many years. This is the more surprising, as another naval surgeon, Frederick Thomson, had published, in 1790, a most practical and suggestive account[11] of how scurvy could be prevented at sea, with many recommendations (largely taken from Lind) for improving the sailors' dietary, and, in 1785, Leonard Gillespie[12] had strongly advocated the substitution of preserved lemon and lime juice for malt, sour krout, and the other naval antiscorbutic stores. He also praises raw potatoes, the value of which he had learned from a sailor. And yet, as late as 1795, we find David Paterson,[13] also a naval surgeon, advising a mixture of nitre and vinegar as "a new, an easy and effectual means of curing the disease."

Lind died forty-one years after his book was published and without seeing his recommendations carried into any practical effect or any diminution in the terrible ravages of scurvy. It is difficult at this distance of time to say why he did not show more energy in such an important matter. He may have tried and been rebuffed; there are no records and speculation is futile, but in a curious sentence Lind himself says, "The Province has been mine to deliver Precepts; the Power is in others to execute."[14] It may explain a good deal, or it may have been a mere mental attitude on his part. It is well known that the great Captain Cook laid more stress on general hygiene than on antiscorbutics,[15] his opinion carried great weight, and he expressed a very guarded judgment on the value of the rob of oranges and lemons proposed by Lind for use at sea.

To appreciate Lind's services to medicine at their proper value it is necessary to know something about the history of scurvy as an endemic European disease, and more especially the attitude towards it of the leading medical authors and practitioners during the two preceding centuries. The story is one which cannot be described as creditable to the profession of medicine. From unknown times scurvy had been endemic among the continental peoples bordering on the Baltic and North Sea as a result of hard conditions of life and their enforced dietary during the long northern winters. All classes had to live largely on salted fish and meat, potatoes were as yet unknown, and fresh vegetables and fruit unobtainable. There was little sunlight, much fog, cold, and rain, and houses were damp, dark, and confined—exactly the same conditions which later on bred scurvy so plentifully on board ship. The disease was one popularly recognised, its cure by fresh vegetables was also a matter of common knowledge handed down traditionally, certain herbs such as scurvy-grass, brooklime, water-cress, and sorrel being especially and justly esteemed as curative. The value of oranges and lemons was also well known through the Dutch sailors who brought cargoes of these fruits from Spain. In the early sixteenth century a few references are found to the disease in non-medical writers, and Olaus Magnus, Archbishop of Upsala, gave, in 1555, in a book widely read,[16] a very accurate account of its symptoms, causes and cure, and tells us that in the vernacular it was known as *scorbock* and to doctors as *cachexia universalis*. The earliest medical writers on scurvy are all of Dutch nationality. They are Johannes Echthius or Echt (in a letter written in 1541, but not published till much later), Johannes Langius (1560), Balduinus Ronsseus or Ronss (about 1564), and Johannes Wierus or Weyer (1567), all of whom give very exact clinical descriptions of the disease and show full acquaintance with its causes, symptoms, and cure. They and certain authors who follow them leave no doubt that scurvy was commonly met with in ordinary medical practice at that time, and they attributed it to an obstruction of the spleen, arising from thickened humours due to corrupt and salted foods and faulty hygienic surroundings. In a word, scurvy in its practical aspects—its diagnosis, causes, prevention, and cure—was well recognised and understood both by the laity and doctors. Then follows an extraordinary chapter in the history of medicine, and at once all this is changed. In 1588 Severinus Eugalenus, a Dutchman practising in Emden, published a treatise on scurvy (*De Morbo Scorbuto Liber*) which went through seven editions, the last as late as 1720. Although a work of pure imagination on his part it rapidly became and long remained the accepted and authoritative account of the disease. He gives in detail seventy-two clinical histories, not one of which is a case of true scurvy or the least like it. They are a collection of mostly chronic medical cases described chiefly by symptoms, and, so far as one can judge, comprise pleurisy, hemiplegia, heart and stomach troubles, rheumatic pains, chorea, mental depression, agues, hysteria, and so on, all described as "scurvy." He diagnosed it infallibly from two signs only, the condition of the urine and of the pulse, with never a word about the gums, hæmorrhages, or other cardinal symptoms. At times he remarks pityingly on the ignorance of other practitioners in failing to recognise it and says, "I diagnosed the disease as soon as I placed my hand on the pulse." He found scurvy in everyone, and attributes its frequent and widespread occurrence to the anger of God for sin. His treatment consisted in the administration of various useless and now forgotten drugs which were supposed to expel melancholic and hypochondriac humours, along with a number of well-known antiscorbutic remedies. And yet Sennert and van Swieten (who died in 1772) both describe him as "the best author on scurvy," and Martin Lister (1694) says that he "deserves much from the republic of letters for first accurately describing this disease." This book exerted an enormous and far-reaching influence and changed the whole medical conception of scurvy. Its doctrines were adopted almost universally by the writing and teaching authorities of the day, and in consequence became rapidly and widely spread. During the seventeenth century, and much later, the English books on the subject are deplorable. Thomas Willis, Charleton, and Gideon Harvey (both physicians to Charles II.), Martin Lister, Pitcairn, John Hall (Shakespeare's son-in-law), and others, all follow the description of Eugalenus more or less closely, or proceed to even greater absurdities, and in reading their fantastic imaginings one doubts if any of them had ever seen a case of true scurvy. Yet this was the teaching of the schools and the practice of doctors. In Germany things were no better. Hoffmann advised spa waters and milk diet as the best cure, and in Holland Boerhaave gave the weight of his authority to the administration of mercury with direful results. In France the disease was apparently unknown and attracted little attention. It is curious to reflect that these men were all more or less contemporaneous with Sydenham who evidently rebels against the indiscriminate diagnosis of "scurvy" for all manner of vague and not fully understood symptoms, and who says "unless we allow this, scurvy will largely increase, as it is at this day, and will in a manner comprise all sorts of diseases."

The general misconception regarding the malady had a deplorable and far-reaching effect on its therapeutics. The traditional and effective antiscorbutic herbs were found quite ineffectual against such a heterogeneous array of other diseases and symptoms as went under the name of "scurvy," and hence all sorts of remedies were recommended and used, until the real remedies, just as had happened with the real disease, were completely lost sight of and buried under a multitude of useless ones. Meanwhile a greater need than ever had arisen for a proper understanding of the disease. During the eighteenth century it had to a large extent disappeared on land owing to improved conditions of living, but as a set-off to this it had assumed disastrous proportions at sea where it had risen to a veritable scourge. Beginning with the famous voyage of Vasco de Gama round the Cape, in 1498, it took a fearful toll of death and sickness on almost every maritime expedition for trade or discovery. It was a new and unknown disease to the Portuguese, Spanish, and French sailors, and equally so to their doctors who were quite unable to cope with it. In 1535, Jacques Cartier's expedition suffered very severely when wintering in Canada, and would probably have perished to a man but for the help of the Indians, who recommended a decoction of the bark and tops of a species of fir tree by means of which health was speedily restored to the voyagers. Here, as in Europe, there was among the unlearned traditional knowledge of the disease and how to treat it successfully. Although many narratives were written by seamen and others regarding their experiences of outbreaks on numerous voyages and expeditions, it is an astonishing fact that there are in English medical literature previous to Lind only two books which afford a reasonable account of scurvy. One of these is *The Surgions Mate* (1617), by John Woodall, who belonged to the "mysterie and fellowship of Barber-Surgions" and was surgeon-general to the East India Company. He enumerates the usual antiscorbutic herbs but adds, "to declare good medicines which cannot be had at sea is time lost," and advises the juice of lemons to be taken as both prophylactic and curative. A great deal of his advice, however, is trifling and irrelevant, and he proposes too many alternative cures and treatments. He says there is "a good quantity of Juice of Lemmons sent in each ship out of England by the great care of the Merchants, and intended only for the releefe of every poore man in his neede, which is an admirable comfort to poore men in that disease"; but Trotter, a hundred and eighty-six years later (1803), narrates an instance "of twenty men dying in scurvy on board an East Indiaman," and inveighs bitterly against it, adding, "I am afraid that occurrences of this kind are very frequent in the ships of the East India Company," and when John Hunter was their surgeon-general he found the supply neither sufficiently ample nor of good quality. Woodall had never been to sea, and he probably got his information from Captain James Lancaster (1600) and other commanders of his day, who had kept their crews healthy by means of lemon juice, but he was also acquainted with the works of the early Dutch writers. Unfortunately all this was forgotten, and ships were sent on long voyages unprovided with lemon juice for nearly two hundred years afterwards. The other book[17] is by William Cockburn (1697) who had held the post of physician to H.M. Fleet. He indulges in much incredible etiology, but says, "green trade, as they call it, keeps a crew free from scurvy," and that "if ever any care is taken for the sick in the navy this must be chiefly considered," but also that it is "a disease left without a remedy at sea." The treatment he advises at sea is an emetic, gruel, and other soft foods, abstinence from salt meats, syrup of althea, and certain other drugs. Laxatives, squills, aromatic sulphuric acid and vinegar were also largely used then and later. During the later eighteenth century the Admiralty supplied as antiscorbutic stores malt and a malt extract, vinegar, aromatic sulphuric acid, salted cabbage, beer, and molasses. The navy allowance of beer was seven pints per day per man, and Thomson[18] says scurvy never appeared at sea as long as the supply lasted but that it soon gave out, which is not to be wondered at. He proposed to keep it up by brewing from treacle, yeast, and hops on board ship.

On the Continent, Kramer, who had been a military surgeon in the Austrian-Turkish War of 1715, wrote of it very well from extensive first-hand knowledge, asserting emphatically that it is not the disease described by Eugalenus, and Bachstrom published (1734) a small book of considerable value in which he asserts that abstinence from fresh vegetables is the one and only cause.

Thus we have the curious phenomenon of two distinct medical literatures of scurvy running side by side for a period of about two centuries, one describing a more or less imaginary disease and the other contributed by men who had been up against the hard facts of the case and who wrote from actual experience of it. Lind put an end to all this. His *Treatise of the Scurvy* was written while he was in practice in Edinburgh and was printed there in 1753, a second edition, which is called a *Treatise on the Scurvy*, appeared in London in 1757, and a third in 1772. He says: "I shall propose nothing merely dictated from theory; but shall confirm all by experience and facts, the surest and most unerring guides"; and again "the world has now almost despaired of finding out a method of preventing this dreadful disease at sea; and it is become the received opinion that it is altogether impossible there either to prevent or cure it." In his chapters on the Prevention and Cure he proceeds to expound his methods, and practically exhausts the whole matter as a measure applicable to the navy. He insists that prevention is not timeously attended to, and he reviews the whole hygiene of ship-life, both mental and physical, in its relations to the production of scurvy. As regards specific treatment he enunciates the broad principles, and gives in detail his methods which are the same as are in force to-day. Land scurvy is also dealt with and considered very fully in various parts of his book. His therapeutical recommendations are based not only on his general clinical experience, but on exact comparative observations carried out on patients in hospital under different remedies, a method which must have been a novelty at the time. He recognised that there is something specific in the value of fresh fruits and vegetables, and he proposed the use of a rob or inspissated juice of lemons and oranges which was not very successful owing to faulty preparation. As regards etiology he considers the *principal and main predisposing cause* in the navy to be the prevailing damp and general discomfort on board ship among the common seamen, with close confinement, depression of spirits and antecedent illness, "an additional and extremely powerful cause" being the want of fresh vegetables and greens. To this combination he attributes "its so general and fatal malignity at sea," but says scurvy will never rise to the height of "a general, fatal, and distinctive calamity where green vegetables abound."

The third edition of the *Treatise* is extremely interesting, as in it he gives his more matured experience, especially in a "Postscript" which contains many additional observations. Two of these are of especial interest, in view of present theories regarding the etiology of scurvy. "Another remarkable, and not an unfrequent occurrence, is—That five or six hundred men, in a long voyage, while living the whole time on salted and hard meats, often continue in perfect health, but soon after they come into a harbour and begin to eat ripe fruits and green vegetables many of them will be seized with an obstinate scurvy. Thus several hundred seamen have been admitted into Haslar hospital who while living at sea on their ships' provisions, enjoyed good health; but began to feel the first symptoms of this disease after they had eat greens and fresh meat for some time at Portsmouth," and these cases took five or six weeks for their cure.

He also gives an account of an outbreak in Hampshire, and of cases which occurred in Haslar Hospital itself in patients who were living on fresh beef, soup, and greens. The outbreak extended to ships lying at Spithead and to others in which there was also a constant supply of fresh foods. Cases continued to occur for about a year and a half. The description given of the symptoms leaves no reasonable doubt that the disease must have been scurvy, and it is not likely that a man of Lind's experience was mistaken. If it was really scurvy, then a deficiency of vitamins cannot be the sole and only factor in producing the disease.

This aspect of the etiology did not escape the observation of Hirsch[19] who says: "We have a series of epidemics of scurvy the origin of which cannot be referred to want of fresh vegetables, or to erroneous and deficient diet at all." After mentioning these he continues, "such instances, rare though they be, serve to show that the disorder of nutrition which underlies the scurvy may as an exceptional thing originate under the influence of other debilitating factors, mostly associated with a life spent in prisons, barracks, or ships." Lind mentions the case of a seaman who for three years was never free from scurvy although treated at Haslar and elsewhere for long periods and with great care. Hess[20] also has an observation of a similar kind—a child which developed scurvy when 6 months old and thereafter received daily a ration of one-half ounce lemon juice, but again developed the disease at 11 months. This child was debilitated by various intercurrent infectious ailments. Other similar cases have been reported in children, and in the old days it was often observed that in a fleet similarly provisioned and under exactly similar conditions as to length of time at sea, certain ships remained healthy while others were decimated by scurvy. Very long voyages were often undertaken with wretched provisions and practically no vegetables, "putrid beef, rancid pork, mouldy biscuit and flour are misfortunes common at sea," says Lind, and yet often no scurvy broke out in the crew, even in three years. All these anomalies raise the doubt as to whether a mere deficiency is by itself sufficient to explain fully the etiology of the disease.

No new matter of any great clinical importance appeared on scurvy until Cheadle (1879) and Barlow (1883) published their well-known descriptions of the disease in infants, which served to emphasise the purely dietetic view of its etiology. Such cases arise from well-intentioned but not very well-informed efforts on the part of doctors, chemical manufacturers and milk companies to provide artificial foods for infants, and it is to be hoped are already incidents of the past.

On the experimental side Holst and Froehlich, in 1907, made the very interesting discovery that scurvy could be readily produced in guinea-pigs by a diet of oats and water, and, in 1912, the very important addition that cereal grains and pulses when allowed to germinate acquire antiscorbutic properties. The deduction made from this is that the antiscorbutic element in fresh plants and meat is an outcome of their active cell metabolism. Since then other experimenters have succeeded in producing typical scurvy in monkeys, but so far not in dogs, rabbits, rats and certain other animals. It is evident from these researches that different species of animals vary greatly in their susceptibility to the disease, just as they do to microbic diseases, and that some species seem to enjoy an immunity. All records show that men also vary much in their individual susceptibility. In the Lister Institute and other laboratories a large amount of quantitative work has been done on antiscorbutics in guinea-pig scurvy, but how far this is directly applicable to man will probably now never be put to the test owing to the practical disappearance of scurvy as a human disease under ordinary conditions of life.

Besides his work on scurvy Lind was the author of two books on naval and tropical hygiene of very great importance for their time. They are *An Essay on the most Effectual Means of preserving the Health of Seamen in the Royal Navy* which was written before he left Edinburgh, and went through three editions (1757, 1762 and 1779), and an *Essay on Diseases incidental to Europeans in Hot Climates* (1768). In these he gives full directions for keeping ships clean and healthy and for disinfecting them. For disinfection and getting rid of vermin he advises thorough washing with the aid of the ship's fire-engine and afterwards with vinegar, exposure of hammocks and bedding to the full breeze, burning of body clothes, and fumigation with sulphur, charcoal, arsenic, and gunpowder, mixed with oakum dipped in tar. The drinking-water was often putrid, and he suggests its purification by filtration through casks of sand, or by charcoal. For the sick-berth he insists on the necessity of strict cleanliness, free ventilation, disinfection of all discharges, linen, and bedding, plenty of air-space, and a convalescent room, things which are a commonplace to-day but were not so then. The surgeons are advised to wear special clothes when on duty (waxed linen being recommended), to wash their hands frequently and not to use sponges, somewhat similar precautions being enjoined on the attendants. Typhus and typhoid were then very prevalent in the navy at times. In tropical fevers he warns against Sydenham's practice of bleeding as "by no means applicable to the fevers which attack Europeans in Guinea," on the grounds that the experience on which such advice was based had been obtained solely in London from inflammatory fevers, and not from dysentery and malaria.

Tertian and quartan agues were very common in England in Lind's time, and serious and deadly malaria on foreign naval stations. His advice regarding prophylaxis both at home and abroad is very full, and in view of recent developments in our knowledge and practice extremely interesting. People on shore are advised by him to live in a house well up on a hill-side, with no stagnant water about it and with no doors or windows facing a marsh, to sleep in the highest rooms and to use smoke fires in them, to avoid being out at night and to shun marshy places at all times. Ships' crews, if compelled to remain ashore overnight, are directed to retire to a close hut and keep up a constant fire, or in default of this to render the room smoky with gunpowder or tobacco, "as fire and smoke afford the most excellent defence against the noxious and dangerous qualities of the night air." Wood-cutting and all kinds of labouring work on shore should be performed by hired natives and not by sailors, who should be engaged as little as possible in river-work or any duty which takes them over swampy ground. The ship should be moored well off the coast and all the crew brought aboard at night. Lastly, he says cinchona bark is the only medicine of any real value, the earlier it is used the better are its results, it should be given in large doses at first and repeated and persevered in daily with smaller doses. It is very evident that all these precautions and directions are such as are most effectual in avoiding and keeping at bay the attacks of the anopheles mosquito, of the agency of which in carrying malarial infection he had of course not the faintest conception, although he was fully convinced that night-time and swampy ground were the two things to be dreaded and guarded against. It is difficult to say where he acquired this information, but certainly not from the medical treatises of his day. Probably a good deal of it was current knowledge and talk among doctors and laymen living in malarious districts, and possibly for some of it he was indebted to his own observation. His mind, however, was of the order which sifts a mass of information and picks out of it the practical and essential. Once again little attention was paid to his advice, which seems to have been much in advance of the medical theories of his day.

Lind also discovered the fact that an abundant supply of good fresh drinking-water could be easily obtained on board ship by distilling sea-water in the cooking coppers or in a special apparatus, which excites astonishment that it had not been thought of and put in practice long before. He also proposed and made a compressed ration of good keeping quality with the idea of preventing a scarcity of provisions at sea.

Judged by his record of work Lind possessed an original and independent mind. In his therapeutical investigations he used the experimental method rigidly, he drew his conclusions only after carefully conducted comparative trials of numerous different remedies, and he reached correct results; in his other lines of research he utilised fully a natural gift for accurate observation, and more especially a faculty for sifting facts and evidence and picking out from the mass the essential points. He avoids all theoretical considerations and tests everything either by experiment or experience, or by careful deduction from soundly ascertained facts. He cannot, in its then circumstances, have owed a very great deal to his medical education in the University of Edinburgh, but when he came into actual contact with the practical aspects of disease on a large scale he showed himself highly capable of grappling successfully with the problems presented to him. These problems were all more or less directly connected with the naval medical service in which he is undoubtedly the most distinguished personality. It is a matter for regret that we possess so little record of his more intimate personal and mental characteristics, but he was certainly modest and unassuming, and imbued with the true spirit of scientific inquiry.

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